

CLAIMS

1. A method for ultrasonic processing of workpieces (33, 34; 53, 54) with a vibratory structure (1) comprising a sonotrode (3, 57) and a converter (2), wherein ultrasonic energy is supplied to the converter (2) by means of an ultrasonic generator (7), which is switched on and off by electrical switch-on and switch-off signals respectively, only for the duration of processing cycles, characterized in that the switch-off signals are generated on the basis of at least one state parameter (P) of the generator (7).
2. A method according to claim 1, wherein a frequency of a current flowing in the generator (7) is used as said state parameter.
3. A method according to claim 1, wherein a phase displacement between a current and a voltage in said generator (7) is used as said state parameter.
4. A method according to claim 1, wherein an electrical ultrasonic power (P) generated by the generator (7) is used as the state parameter.
5. Apparatus for ultrasonic processing of workpieces (33, 34; 53, 54), comprising: a vibratory structure (1) having a sonotrode (3, 57) and an electromechanical converter (2), a generator (7) connected to said converter (2) and adapted to supply ultrasonic energy, means (24, 25) for generating switch-on and switch-off signals for said generator at the start and end respectively of processing cycles, and at least one output means (17, 18 or 43) for providing a selected electrical state parameter (P) of said generator (7), wherein said switch-off signals can be generated on the basis of the at least one state parameter (P).
6. Apparatus according to claim 5, wherein a frequency of a current flowing in the generator (7) is said state parameter.
7. Apparatus according to claim 5, wherein a phase displacement between a current and a voltage in said generator (7) is said state parameter.

8. Apparatus according to claim 5, wherein an effective power (P) generated by the generator (7) is the state parameter.

5 9. Apparatus according to claim 5, wherein said output means (17, 18 or 43) is connected to a circuit (44 to 51) for providing said switch-off signal, said circuit (44 to 51) issuing said switch-off signal when said state parameter (P) deviates by a predetermined amount from values which it can assume during a processing duration recognised as usable.

10 10. Apparatus according to claim 9, wherein said switch-off signal can be generated when said state parameter (P) deviates by a predetermined amount from an average value which occurs during a processing interval recognised as usable between predetermined instants of time.

15 11. Apparatus according to claim 9 or 10, wherein said circuit (44 to 51) can in each case be activated only a predetermined length of time ( $t_4$ ) after appearance of the switch-on signal ( $t_0$ ).

20 12. Apparatus according to claim 5, wherein said switch-off signals can be generated in spot, rivet or stud welding at instants in time ( $t_5$ ) which correspond to application of a predetermined contact surface (32) of said sonotrode (3) to an associated workpiece (34).

25 13. Apparatus according to claim 12, wherein said contact surface (32a) of said sonotrode (3) is chosen larger than is at least necessary for carrying out the processing.

14. Apparatus according to claim 5, characterized in that said switch-off signals can be generated in surface welding with energy directors (60) at instants in time which correspond to two workpieces (53, 54) to be joined being brought into flat contact.